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Prevalence of Dental Malocclusion and Root Elongation in Pet Rabbits of Ahvaz, Iran

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Abstract

Malocclusion and overgrowth of continuously growing teeth is a frequently seen problem in pet rabbits. In the present study, the studied rabbits were divided based on age into two groups (less than 3 years and above 3 years). They were 1–5 years old and had mean body weight of 2250 gr. It was diagnosed 5 cases of malocclusion and root elongation of grade 2 and 2 cases of grade 4. Affected rabbits were referred with signs of epiphora, pain, anorexia, disability for grooming, dermatologic problems, digestive disorders and salivation. In this study the prevalence of dental disorders (malocclusion and root elongation) was 6.7% (7 out of 105) in pet rabbits of Ahvaz city. Prevalence was significantly higher in rabbits above 3 years (14.89%; 7 out of 47) compared with rabbits less than 3 years (0%; 0 out of 58) (P=0.003). It was significantly higher in those rabbits that were in house for long times (lack of sunlight) and were fed with soft fiber also (P=0.001). Although, prevalence was higher in female rabbits (9.09%; 4 out of 44) than males (4.92%; 3 out of 61), but the difference was not significant (P=0.43). The skull radiograph revealed dental disorders. A feature of acquired dental diseases in rabbits was abnormal calcification in the skull especially alveolar bone. In a radiograph of the skull, changes in the structure and hardness of the cheek teeth had led to uneven wear.

Keywords: root elongation, dental malocclusion**,** overgrowth, rabbit, Ahvaz

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Introduction

As rabbits are increasingly being kept as pets, it is important for the veterinary practitioner to be aware of the specific health problems of these animals. Dental disease is one of the most common reasons for pet rabbits to need veterinary treatment for many years. There is a progressive syndrome of acquired dental disease and malocclusion in rabbits that is characterized by elongation of the roots of the teeth. Dental disorders typically occur in pet rabbits that are housed indoors, bedded on hay and fed on mixed cereal rations, with or without occasional vegetables. Wild and pet rabbits that live outside all year round with unrestricted access to grazing and browsing do not develop this syndrome. Lack of dental exercise and uneven wear has been suggested as a cause of enamel spurs on the cheek teeth. Radiography is necessary for differential diagnosis of different grades of dental disorders. A feature of acquired dental disease in rabbits is poor calcification of the bones of the skull, especially the alveolar bone that surrounds and supports the teeth. Loss of alveolar bone at the apex of the tooth allows the continually growing roots to elongate and eventually penetrate the periosteum. The dental formula for a rabbit is: 2 x (I 2/1: C 0/0: P 3/2: M 3/3) = 28 (Harcourt–Brown, 2002, Caelenberg *et al.*, 2008).

The progression of acquired dental disease in rabbits is categorized to 5 grades:

Grade 1: Normal, Grade 2: At this stage, the incisors may not have horizontal ribs in the enamel although the shape of the teeth and occlusion can be normal. Hard swellings may be felt along the ventral border of the mandible. These are associated with elongated roots of the mandibular cheek teeth. Epiphora may be present that is caused by obstruction of the nasolacrimal duct by elongated roots of the upper primary incisors. Grade 3: Loss of supporting bone and alterations in the position, shape and structure of the teeth changes the direction of growth and results in malocclusion. The mandibular incisors tend to tip forward. The maxillary incisors curl and rotate laterally. The mandibular cheek teeth tip towards the tongue and the maxillary cheek teeth flare towards the buccal mucosa. It is possible to have healthy incisors and major changes in the cheek teeth or vice versa. Incisor malocclusion can be caused grooming difficulties or problems prehending food. Sharp spurs on the lower cheek teeth can lacerate the tongue causing anorexia, salivation and pain. Dacryocystitis and abscesses can be seen in this grade. Grade 4: The teeth become so diseased that destruction of germinal tissue at the apex of the tooth results in slowing and cessation of tooth growth. Affected rabbits can manage to eat, albeit slowly with any teeth that remain in occlusion. There can be permanent grooming difficulties and recalcitrant epiphora and dacryocystitis. Many cases do not progress from this stage. Periapical abscesses can occur at any stage. Grade 5: Epiphora, chronic dacryocystis or rhinitis are often seen in grade 5. It is categorized two subgroups: grades 5a and 5b. Osteomyelitis and abscess formation are seen in grade 5a. There are calcification of the teeth and surrounding bone in grade 5b. Sometimes the crowns break off and roots remain embedded in the bone. Affected rabbits are usually debilitated. It is advised exposure to ultraviolet light (sunshine) and all sources of calcium for the affected rabbits (Pollock, 1951; Joel and William, 1983; Flower, 1986; Emily, 1991 and Harcourt–Brown, 2002). The aim of this study was to determine the prevalence of dental disorders (malocclusion and root elongation) in pet rabbits of Ahvaz district, South-West of Iran. Nutrition role was detected in pet rabbit dental health.

Material and methods

The present study was accomplished during a three-year period (January 2006 to February 2009) and based on taking history, clinical examination and radiographic findings. A total of 105 pet rabbits aged 1– 5 years old were

selected randomly. The rabbits used in this study were referred cases to Veterinary Hospital of Ahvaz University. Most of the rabbits had been referred for other reasons mostly for check up. They had mean body weight of 2250 gr. The studied rabbits were divided into two age groups as less than 3 years and above 3 years. Rabbits were comfortably restrained in a towel for examination of the oral cavity with a lighted speculum. Lateral and oblique radiographic views of skull were obtained to determine whether apices are elongated and teeth are malformed. Finally status of nutrition was studied for using of hard foods (hard fibers) that are necessary in prevention of overgrowth and malocclusion. Meanwhile, the maintenance environment of the studied rabbits (outside or inside in house) was evaluated. Pain management, fluid therapy and assisted feeding (a diet composed primarily of hard fibers and fresh vegetables) were administrated for rabbit dental diseases. Malocclusion and root elongation were reported as grade 1 to 5 (Harcourt–Brown, 2002).

Statistical Analysis

Rabbits were grouped by age, sex, clinical and radiographic findings, status of nutrition and maintenance environment. The obtained data were analyzed by SPSS 16.0 statistical software, using Chi-square analysis, Fisher's exact test and Z test. Differences were considered significant when $P< 0.05$.

Results

Dental disorders were confirmed in 7 cases (6.7%), based on the results of examinations (clinical and radiographic evaluation) (Tables 1 and 2). It was diagnosed 5 cases of malocclusion and root elongation of grade 2 and 2 cases of grade 4. Upon physical examination, they had signs such as epiphora, pain, anorexia, disability for grooming, dermatologic problems, digestive disorders and salivation (at least 2 signs). Prevalence was significantly higher in rabbits above 3 years (14.89%; 7 out of 47) compared with rabbits less than 3 years (0%; 0 out of 58) ($P=0.003$). Prevalence was significantly higher in those rabbits that were for long times in house (lack of sunlight) and were fed with soft fiber (18.42%; 7 out of 38) compared to feeding with hard fiber (0%; 0 out of 67) also ($P=0.001$). Although, prevalence was higher in female rabbits (9.09%; 4 out of 44) than males (4.92%; 3 out of 61), but the difference was not significant ($P=0.43$). The overall changes of the skeletal were observed on the lateral and oblique views of radiographic examination.

In the affected rabbits to dental disorders (grade 2), examination of the teeth and surrounding structures revealed abnormalities. Hard swelling was felt along the ventral border of the mandible. These were associated with elongated roots of the mandibular cheek teeth. The teeth were become increasingly curved. The alteration in the shape of the incisors was changed the way in which they occlude and wore against each other. The crowns of the cheek teeth had lost their zigzag occlusal pattern. Epiphora was present that was caused by obstruction of the nasolacrimal duct by elongated roots of the upper primary incisors (Fig. 1).

In malocclusion and overgrowth (grade 4), the teeth were become so diseased that destruction of germinal tissue was caused at the apex of the tooth. Periapical abscesse did not occur in any of two affected rabbits. The most radiographic findings were abnormal calcification in the skull especially alveolar bone. Low density in alveolar bone was caused the elongation and penetration of tooth roots in the periosteum. In radiograph of the skull, changes in the structure and hardness of the cheek teeth had led to uneven wear (Fig. 2).

Discussion

Dental disease is one of the most common problems seen in pet rabbits in clinical practice. In the past, it has not always been recognised, or has been misdiagnosed as anorexia due to gastric hairballs. In some

Table1: Characteristics of the pet rabbits based on age and sex in the studied population, January 2006 to February 2009

Groups / Characteristic		Pet rabbits (n = 105)	
Age		< 3 years (n = 58)	> 3 years (n = 47)
Sex	Male	33	28
	Female	25	19
Number of affected rabbits		-	7 (6.7%)

Table1: Characteristics of the affected rabbits based on age, sex, clinical signs and nutrition status in the studied population from January 2006 to February 2009

Characteristic / Affected rabbits	Age (years)	Sex	Clinical signs (epiphora, pain, anorexia and …)	Root Elongation and Malocclusion	Nutrition status	
					Lack of hard fiber	Lack of sunlight
1	3.5	female	+	Grade 2	+	+
2	4	male	+	Grade 4	+	+
3	5	female	+	Grade 2	+	+
4	4.5	male	+	Grade 2	+	+
5	3.5	male	+	Grade 2	+	+
6	5	female	+	Grade 4	+	+
7	3.5	female	+	Grade 2	+	+

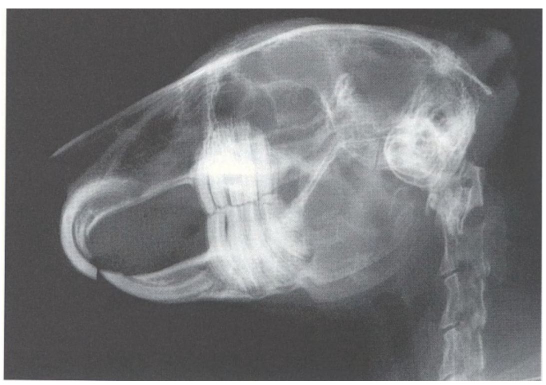


Figure 1: Lateral radiograph of the skull: Root elongation and deterioration in tooth quality (Grade 2 of malocclusion and overgrowth)

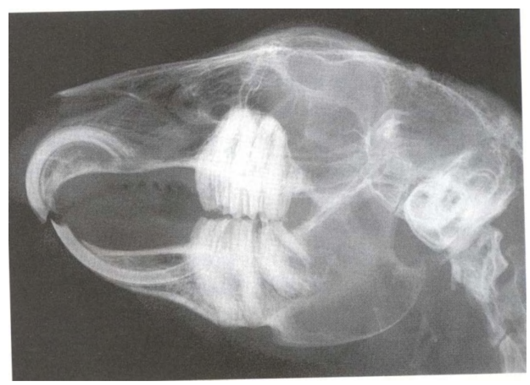


Figure 2: Lateral radiograph of the skull: Cessation of tooth growth (Grade 4 of malocclusion and overgrowth)

popular breeds, especially extreme dwarf and lop breeds, the incidence approaches nearly 100 per cent. Dental disorders were previously considered to be congenital, but it has now become evident that other factors including metabolic bone disease, dietary texture and genetic predisposition are involved, although congenital malocclusion does occur (Wiggs and Lobprise, 1995; McDonald *et al.*, 1996; Harcourt – Brown, 2002; Johnson and Watson, 2005). Malocclusion of the premolars and molars has been more reported in individual old rabbits (Brommage *et al.*, 1988). In our study, prevalence was significantly higher in rabbits above 3 years (14.89%) compared with rabbits less than 3 years (0%) (P=0.003).

Dental disorders is relatively common in Iran, where many rabbits are fed mainly with phosphorus diets, low calcium and vitamin D, living in house and lack of hard fiber and sunlight. In the present study, prevalence was significantly higher in those rabbits that were kept for a long time in the house and were fed with soft fiber (18.42%) compared to feeding with hard fiber (0%) (P=0.001). In our study, all of the affected rabbits (6.7%;) were in house and had no access to sunlight.

Dental problems are important clinical

entity, and should be considered in all of rabbits presenting with signs such as epiphora, pain, anorexia, disability for grooming, dermatologic problems, digestive disorders and salivation. A higher prevalence was seen in female rabbits (9.09%) than males (4.92%) in our survey, but the difference was not significant between different sexes (P>0.05). As a general, gender seems not to be a determining factor, as other studies have concluded (Harcourt–Brown, 2002).

We purpose that radiography is accomplished in all of rabbits that have been more fed with soft fibers without supplemented with calcium or vitamin D3, particularly in rabbits with high age (Harcourt-Brown, 1997). It seems a sufficient amount of ultraviolet in sunlight each day and adequate supplies of calcium in the diet can prevent overgrowth of teeth.

Weisbroth and Ehrman (1967) recognized that Ectopic tooth roots could penetrate the bones of the skull and result in abscessation. Westerhof and Lumeij (1987) suggested that lack of hard food might be a predisposing factor for cheek teeth problems. Abe (1989) reported that demineralization of supporting alveolar bone results in tooth movement and the development of malocclusion. In calcium deficient, demineralization of alveolar bone occurs before changes are seen in other bones (Harcourt – Brown *et al.*, 2002 and Okuda *et al.*, 2007). It was found that orthodontic tooth movement was three to four times greater in rabbits with corticosteroid-induced osteoporosis than in the untreated control group (Ashcraft *et al.*, 1992).

Harcourt-Brown (1995) showed that the skulls of affected rabbits had a visual osteodystrophic appearance suggestive of metabolic bone disease. Wiggs and Lobprise (1995) reported that the diseases of the temporomandibular joint may be responsible. Jenkins (1997) believed that cheek tooth malocclusion is a result of abnormal wear caused by incisor malocclusion. He suggested ageing as a cause of cheek teeth malocclusion. Brown (1992) cited inflammation of the molar roots as a cause of primary molar malocclusion leading to secondary incisor malocclusion. Crossley (1998) attributed root elongation with continually growing teeth to lack of dental wear, which results in coronal elongation, stretching of the masseter muscles and an increase in resting intraocclusal pressure. Engstrom (1998) showed that hypocalcemia in rats lead to enhanced alveolar bone resorption in response to a moderate orthodontic force.

Harcourt-Brown (1995) reported that distorted growth of the crowns can be lead to lacerations to the tongue or inside the cheek, weight loss and problems with grooming. In another study by Mullan and Main (2006), it was showed that the most common breed was the dwarf lops (with study on 102 pet rabbits). In another study, dental problems were diagnosed in 38.1 per cent of the rabbits. In the rabbits, the maxillary right P3, mandibular right P3, P4 and M1 and mandibular left P3, P4, and M1 were the teeth most frequently affected (Jekl *et al.*, 2008).

The food manufacturers have been reported that calcium, phosphorus and vitamin D supplements are incorporated into the pellets. Calcium deficiency may be caused osteomalacia but dietary excess may be caused urolithiasis. Vitamin D deficiency may also exacerbate calcium deficiency (Harcourt-Brown, 1995).

Our study that is a preliminary investigation on dental disorders of pet rabbits emphasize that it must be questioned of owners about the feeding preferences of their pets and if it is necessary, samples of rabbit food are analyzed for calcium and phosphorus. A diet of fresh growing grass, hay and dried grass with small quantities of unimproved herbage (i.e. wild type, not commercially grown herbs and vegetables) is very effective at keeping the teeth worn down as it requires prolonged chewing using the full surfaces of the cheek teeth. This type of diet should be introduced as soon as possible post treatment (Bourdeau *et al.*, 1986 and Zimmerman *et al.*, 1990). Osteopetrotic rabbits exhibited major

aberrations in shape and eruption of incisors (Popoff and Marks, 1990, Wolf *et al.*, 1993).

As treatment of these dental disorders are very difficult and expensive, prevention of dental diseases are important. Nutrition plays a pivotal role in pet rabbit dental health. There is a variety of artificial chews and blocks available from pet shops for this purpose (Kirk and Bonagura, 1989; Cheeke, 1994 and Kirk *et al.*, 1995). Unfortunately most cases are not seen, until irreversible apical changes have occurred, so life-long treatment is frequently required. Good quality hay must be available to all pet rabbits at all times. A selection of vegetables can be offered daily. In conclusion, we emphasize that radiography is a valuable tool in the assessment of dental disease. Radiography gives useful information about the position and condition of the tooth roots. Owners need to be advised of the difficulties of dental when their rabbit is diagnosed. They may request euthanasia for their rabbit on financial grounds. To prevent dental disease, owners should be encouraged to feed grass and other fibrous weeds such as dandelions, bramble and tree leaves.

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شیوع بدشکلی دندان ها و رشد بیش از حد ریشه در خرگوش‌های خانگی اهواز، ایران

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چکیده

یکی از مشکلات معمول در خرگوش‌های خانگی، بدشکلی و رشد بیش از حد دندان‌هایی است که به طور مداوم در حال رشد هستند. در مطالعه حاضر، خرگوش‌های مورد مطالعه بر اساس سن به ۲ گروه (کمتر از ۳ سال و بالای ۳ سال) تقسیم بندی شده بودند. آنها در محدوده سنی ۱ تا ۵ سال بودند و میانگین وزن بدنی ۲۲۵۰ گرم داشتند. پنج مورد بدشکلی و بزرگ شدگی ریشه از درجه ۲ و دو مورد از درجه ۴ تشخیص داده شد. خرگوش‌های مبتلا با علائم اپیفورا، درد، بی اشتهایی، عدم توانایی در تیمار کردن، بیماریهای پوستی، اختلالات گوارشی و ریزش بزاق ارجاع داده شده بودند. در این مطالعه، شیوع عوارض دندانی (بدشکلی و بزرگ شدگی ریشه) در خرگوش‌های خانگی شهرستان اهواز ۶/۷٪ (۷ تا از ۱۰۵ مورد) به دست آمد. شیوع بیماری به طور معنی‌داری در خرگوش های بیشتر از ۳ سال (۱۴/۸۹٪ ؛ ۷ تا از ۴۷ مورد) در مقایسه با خرگوش‌های کمتر از ۳ سال (۰٪ ؛ ۰ از ۵۸ مورد) بیشتر بود (p=۰/۰۰۳). شیوع همچنین به طور معنی‌داری بیشتر در خرگوش‌هایی بود که برای مدت طولانی در داخل منزل (دور از نور آفتاب) نگهداری می‌شدند و با سبزیجات نرم تغذیه شده بودند (p=۰/۰۰۱). اگرچه شیوع در خرگوش های ماده (۹/۰۹٪ ؛ ۴ تا از ۴۴ مورد) بیشتر از نرها (۴/۹۲٪ ، ۳ تا از ۶۱ مورد) بود، اما تفاوت از نظر آماری معنی‌دار نبود (p=۰/۴۳). رادیوگرافی از ناحیه جمجمه، عوارض دندانی را نشان داد. یک یافته از بیماریهای دندانی در خرگوش‌های مزبور، کلسیفیکاسیون غیر طبیعی فک‌ها، به ویژه در استخوان آلوئولار بود. در رادیوگرافی از جمجمه، تغییرات در ساختمان و رادیواپسیته دندانهای گونه‌ای و در نتیجه رشد نابجای آنها ایجاد شده بود.

واژگان کلیدی : بزرگ شدگی ریشه، بدشکلی دندان، رشد بیش از حد، خرگوش، اهواز